

# ZSSC3240

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## 1. Computer Requirements

A Windows®-based computer is required for interfacing with the kit and configuring the part. The user must have administrative rights on the computer to download and install the Evaluation Software for the kit. The computer must meet the following requirements:

- Windows® XP SP3, Vista SP1 or later, 7 (including SP1), 8, 8.1, 10
- Supported architecture: x86 and x64
- Available USB port
- Internet access

## 2. Mass Calibration System (MCS)

The MCS consists of the following hardware (HW) components:

- Communication Board V4.1 (CB)  
For more details, refer to the *SSC Communication Board V4.1 Datasheet*.
- Mass Calibration Board 2.1 (MCB)  
For more details, refer to the *SSC Mass Calibration Board V2.1 Datasheet*.

To enable the usage of the MCS, a graphical user interface (GUI) is provided within the Evaluation Software. The ZSSC3240 Evaluation Software, from the revision v3.1, supports the use of the SSC Mass Calibration System shown in Figure 1. The MCS can be used for configuration, evaluation, and for parallel calibration of multiple ZSSC3240 devices under test (DUTs) connected to the terminals at the Mass Calibration Board (MCB).

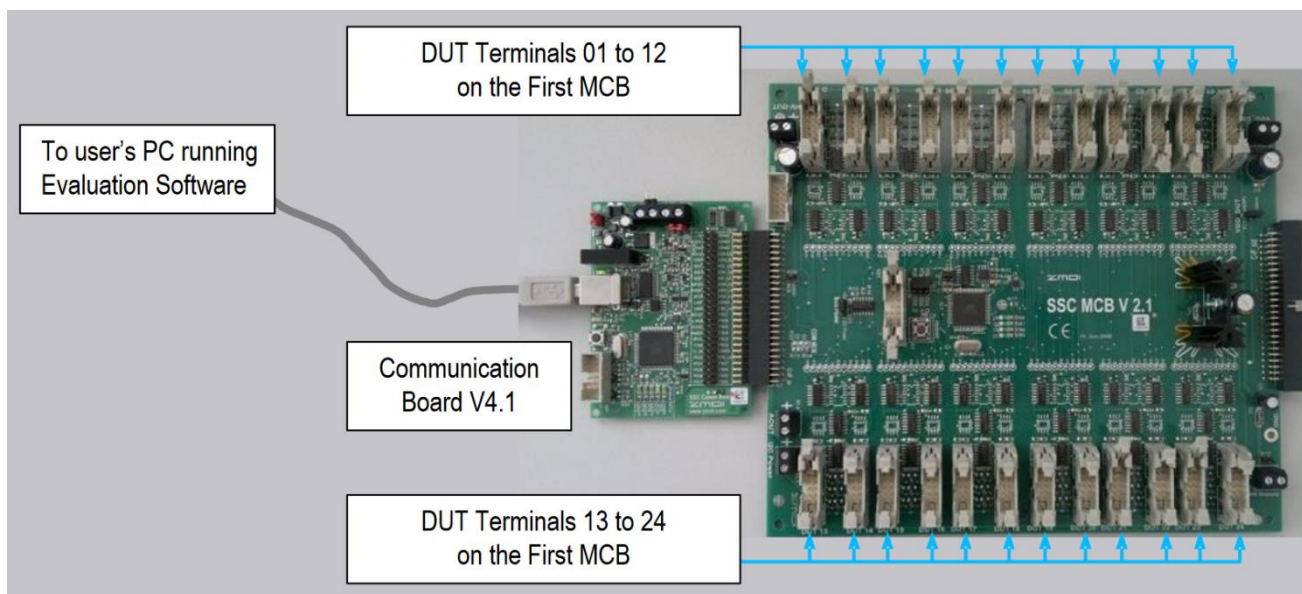


Figure 1. Mass Calibration System

### 2.1 MCB Configuration for ZSSC3240

Refer to *SSC Communication Board V4.1 Datasheet* for the identification of the connectors' location on the PCB.

Mandatory MCB configuration for applying the ZSSC240 Evaluation Software is the following:

- Board ID of the first MCB connected must be a 000<sub>BIN</sub>. The board ID is set by jumpers at the connector K4. If more than one MCB is used, the assignment of these MCBs has to be done in ascending order.

To use the MCS with minimal effort, it is recommended to use the MCB internal supply options for the connected DUTs and for the I2C bus. Use the following jumpers setting to enable this option:

- **Connector K14:** Short the center pin to “int(5P)”  
The DUTs are powered by the MCB’s 5V supply voltage regulator.
- **Connector K23:** Short the center pin to “+5V”  
The communication lines are supplied with the internal +5V<sub>DD</sub>.
- **Connector K17:** Mandatory external supply voltage for the MCB. The required power supply must be in the range of 8 to 16 VDC.

The MCB is connected instead of the ZSSC3240 Evaluation Board (EB) at the 50-pin connector (K5) to the SSC Communication Board (SSC CB). Refer to the *SSC Mass Calibration Board Data Sheet* for further details of MCS and hardware configuration options.

For the connection of ZSSC3240 DUTs to the Mass Calibration Board (MCB), the pin assignment of the MCB DUT connector has to be considered.

The Evaluation SW revision v3.1 is supporting only the I2C communication to the MCB. Therefore, the signals VDDA, GND, SDA, and SCL have to be connected for proper communication.

Note: SW support for OWI-communication will be implemented in a future Evaluation SW revision.

### 3. Mass Calibration SW

Start the Evaluation SW only after the Communication Board is connected to a master PC (Personal Computer) via Universal Serial Bus (USB) and an MCB is connected to the CB at 50-pin connector. If all electrical and SW requirements are met, the SW detects the MCB and the GUI appears as shown in Figure 2.

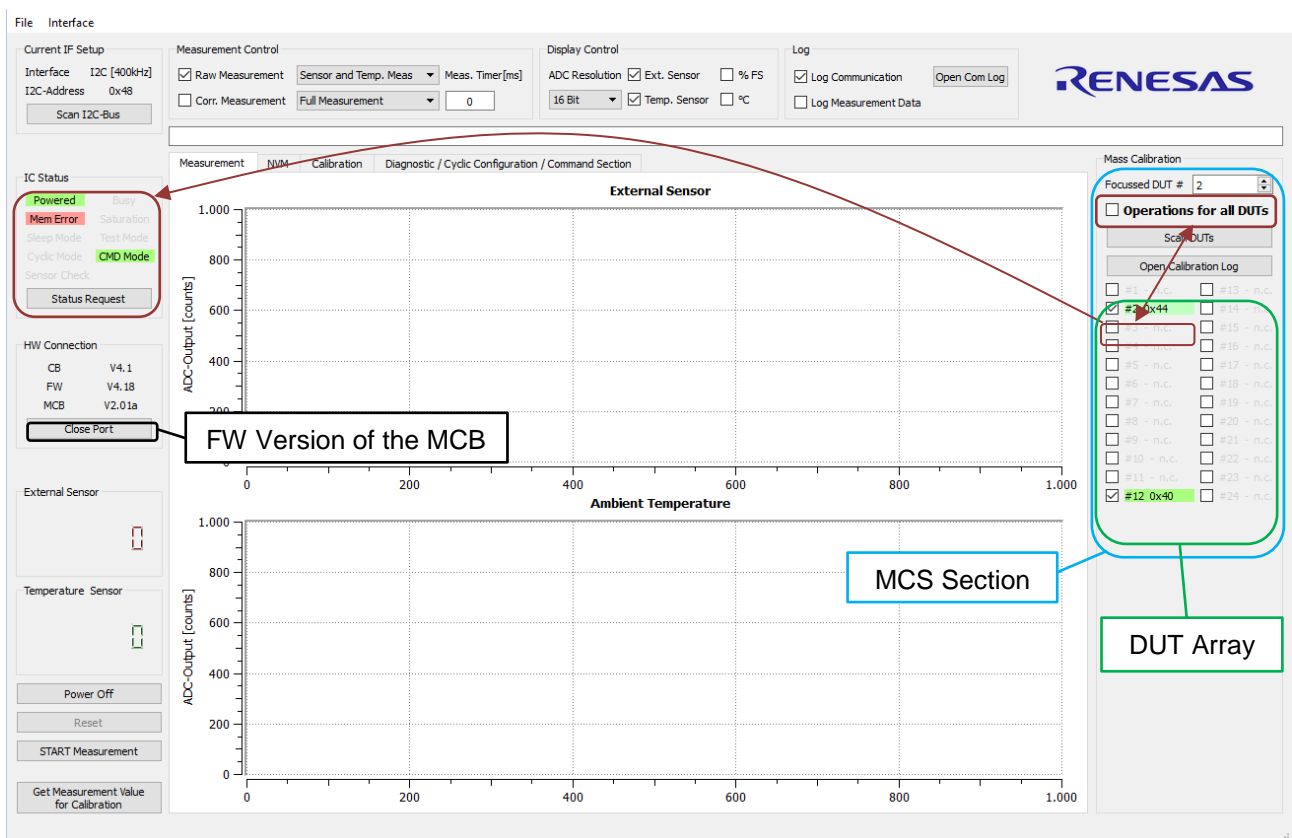


Figure 2. Initial GUI Appearance with Detected MCB

MCS functionalities and the status byte information of DUTs which were initially detected on the MCB I2C bus. After a successfully accomplished COM port communication, the SW starts a scan over I2C addresses and over DUT terminals. A detailed description of the applied scan is given in section 5.1. The status of all MCB DUTs is displayed after the scan.

Note: all connected DUTs to the MCB must have the same I2C address in order to be detected.

The SW distinguishes and displays different IC statuses as shown in Table 1.

**Table 1. IC/DUT Status Reported in the MCS Selection**

GUI Display [DUT, Status]	IC-Status	Status Byte Bits = '1'	Comment
#2 0x40	0x40	POWERED	<ul style="list-style-type: none"> <li>Target status after calibration, except when the cyclic mode is aimed as default mode</li> </ul>
#2 0x44	0x44	POWERED, MEMORY ERROR	<ul style="list-style-type: none"> <li>Good operational status</li> <li>CRC writing needed to target status</li> </ul>
#2 0x6X	0x64	POWERED, BUSY, MEMORY ERROR	<ul style="list-style-type: none"> <li>In Busy state, the ZSSC3240 rejects any commands</li> <li>Writing to memory not possible</li> </ul>
#3 - n.c.	0x00 / 0xFF	- all	<ul style="list-style-type: none"> <li>Not connected to avoid invalid communication</li> </ul>
#2 0xPO	0x00 / 0xFF	- all	<ul style="list-style-type: none"> <li>DUT with valid calibration status detected at the I2C-bus, but it is unpowered</li> </ul>
#12 0x44 CR!	0x44	POWERED, MEMORY ERROR	<ul style="list-style-type: none"> <li>Actual IC status is good</li> <li>CR – Coefficient Range (Calculated coefficients are out of range)</li> </ul>

The status displayed in the MCS section is indicating the ability for calibration. The detailed status byte information with the bitwise assignment can be monitored by setting the focus to the desired DUT (see section 5.2). Green colored background of DUTs are applicable for calibration. Status display with a red background signalize that calibration is not proceeded due to a critical state of the DUT. Main reasons for it are a *BUSY* bit detection in the status byte (first hex character is a 6) or out-of-range calculated coefficients (CR is added to the provided DUT status). In both cases, the concerned DUT is automatically unchecked from the list of DUTs for further calibration steps.

Figure 3 shows the DUT#2 with an IC status where the *BUSY* = 1. The selection box is unchecked automatically by the SW and the user information bar in the GUI is showing the addition statement 'DUT #x removed from the operation list'.

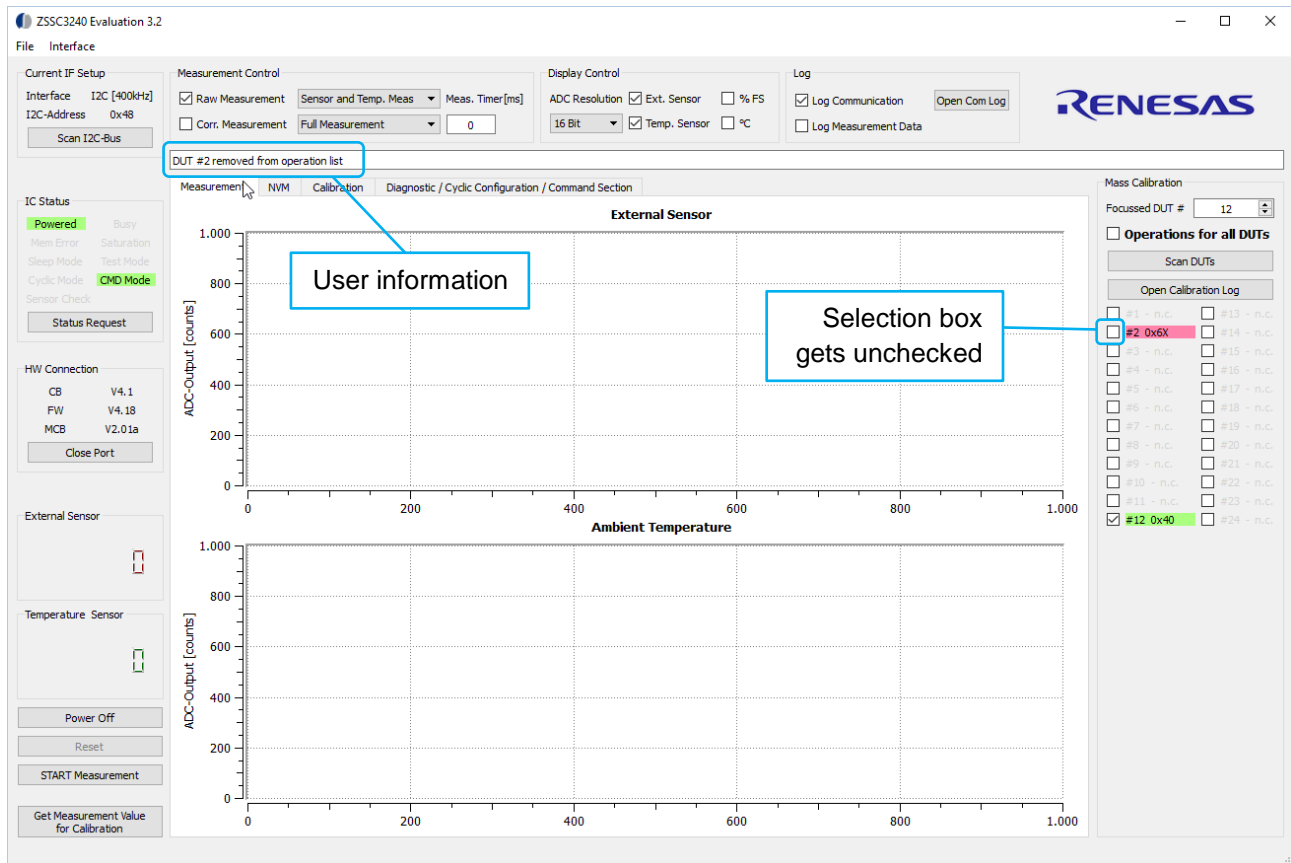


Figure 3. DUT with Detected *BUSY* Status

## 4. MCS Operating Modes

*Single DUT Mode* and the *All DUT Mode* can be applied using the SW for mass calibration purpose, see sections 4.1 and 4.2 for details.

### 4.1 Single DUT Mode

This is the default mode at GUI opening. Almost all functionalities and button actions are available when the Evaluation Board is used with a single ZSSC3240 device. Every user triggered interaction is applied to the focused DUT, which is displayed in the *Mass Calibration* (MC) section of the GUI, see Figure 2.

Refer to the Evaluation Kit documentation for further details regarding the general usage of the Evaluation Software.

### 4.2 All DUTs Mode

Enable this operation mode by the *Operation for all DUTs* check box. During this operation mode, all available buttons and functions are indicated by yellow color, see Figure 3. DUT scanning is described in section 5.1.

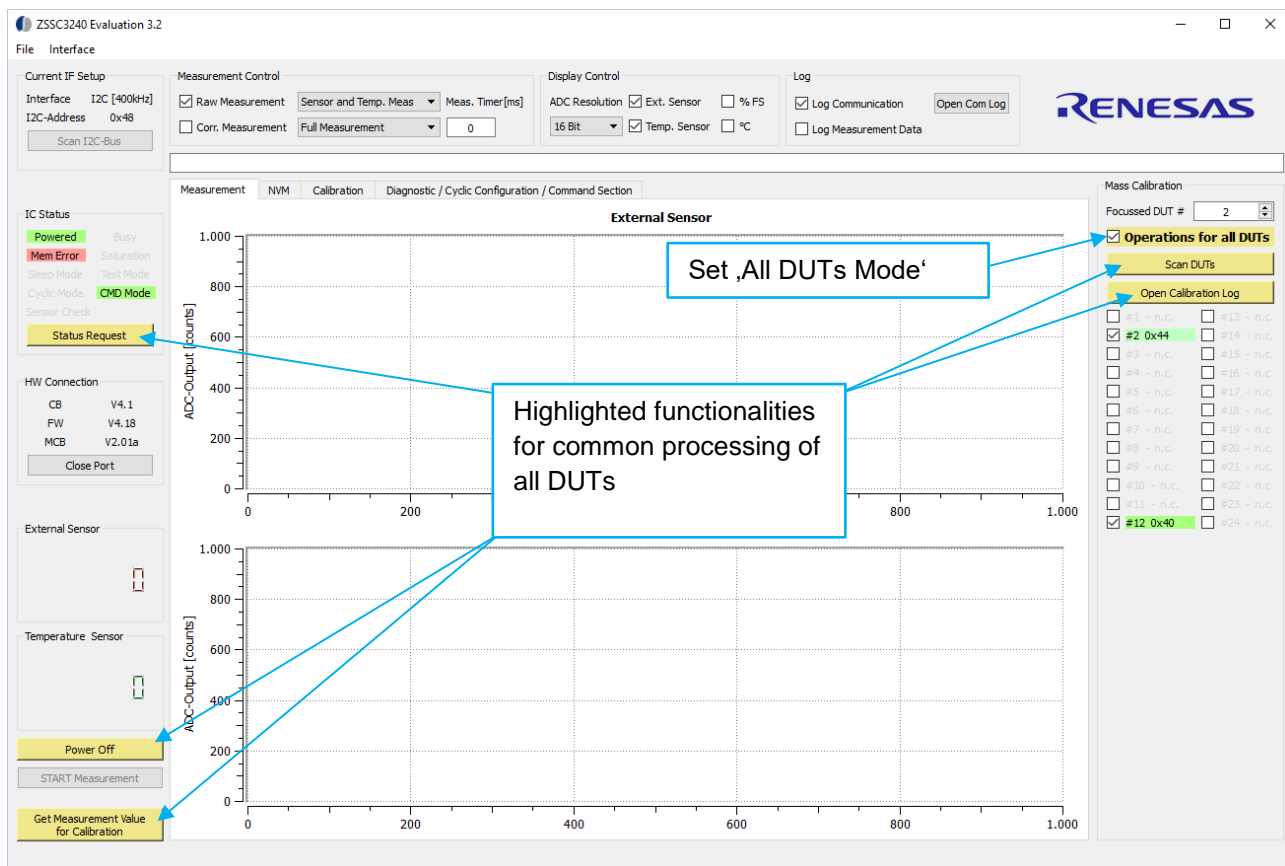


Figure 4. Applying All DUTs Mode

### 5. Additional MCB Functionalities

The GUI provides several option for calibrating DUTs in sequentially multiplexed flow. The SW allows to trigger one action to be executed for all detected devices on the bus. For it, the SW has to identify how many DUTs are connected to the MCB and their electrical status.

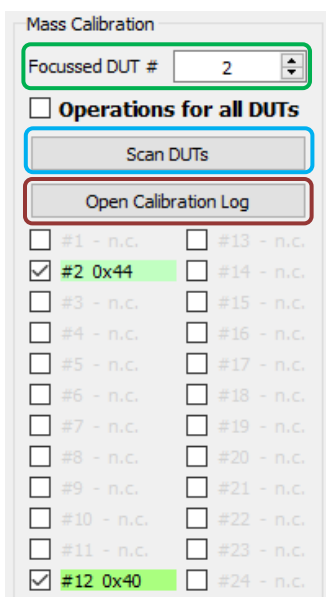


Figure 5. Functions in Mass Calibration Section

## 5.1 Scan DUTs

Start DUT detection by clicking the *Scan DUTs* button in the *MC* section, see Figure 4. The same scan is executed automatically when the SW is started and a MCB connection is established.

The scan runs from DUT#1 to DUT#24, where each DUT is powered individually and the IC status is requested and evaluated. Prior to the status evaluation, the valid I2C address is found by performing a scan over the possible I2C addresses from 0<sub>HEX</sub> to FF<sub>HEX</sub>.

If a DUT is providing an acknowledge (ACK, after the address byte sent from the master) to a certain I2C address, this I2C address is set to be default for all other DUTs. For the following DUTs on the I2C bus, the current circuitry status is requested using this default I2C address.

The complete DUT scan flow is illustrated in Figure 6.

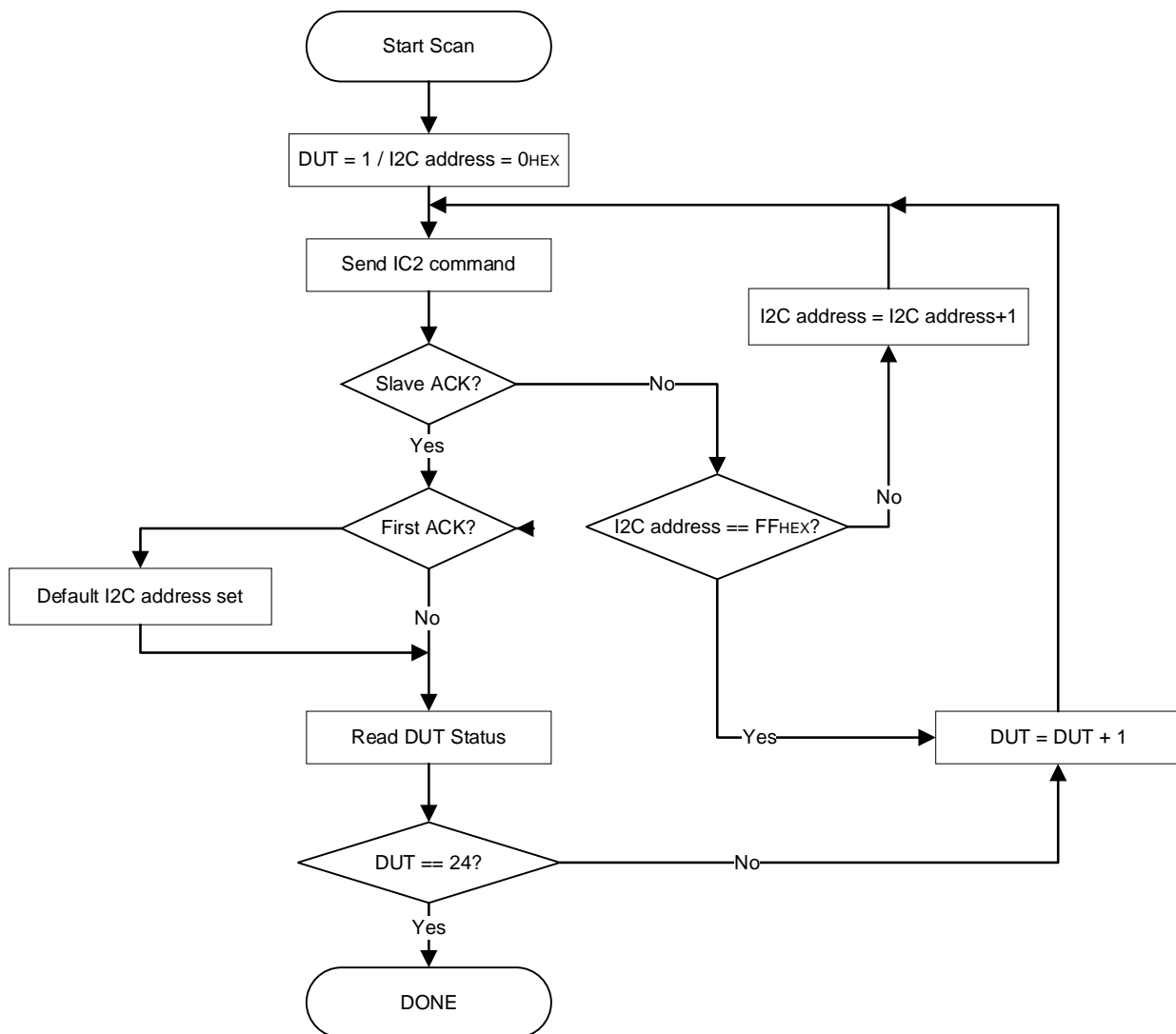


Figure 6. DUT Scan Flow

The outcome of the DUT scan is a list of DUTs, which are usable for calibration. They are displayed in the MCB DUT array on a green background (see ). DUTs without electrical connection and those with a *BUSY* = 1 in the IC status are not part of the list and therefore they appear with an unchecked selection box in the *Mass Calibration* section.

### 5.2 Focus on One DUT

The SW provides the ability to set the focus on one DUT from the list of those that are eligible for the calibration process. For it, the according DUT number (*Focussed DUT #*) has to be incremented or decreased by clicking the arrows on the right side of the field. The DUT number can also be entered manually into the field (green encircled in Figure 5). This feature enables the user to consider each DUT in detail, for example, for purposes of investigating measurement output under given conditions, or for reviewing the NVM content. Changing the focused DUT number causes an immediate update in the GUI for all relevant DUT related information, see Table 2.

**Table 2. Calibration Tab Data Switching the Focus between DUT#2 and DUT#12**

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<p>Calibration Points</p> <p>2 Points: B(O+G)</p> <table border="1"> <thead> <tr> <th></th> <th>S[%]</th> <th>S[counts]</th> <th>T[°C]</th> <th>T[counts]</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>25</td> <td>1659648</td> <td>30</td> <td>-1112064</td> </tr> <tr> <td>2</td> <td>75</td> <td>5470528</td> <td>30</td> <td>-1110016</td> </tr> <tr> <td>3</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>4</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>5</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>6</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>7</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <p>Temperature Limits: Tmin[°C] <input type="text" value="-40"/> Tmax[°C] <input type="text" value="125"/></p> <p>Calculate Coefficients Write Coefficients to Memory</p> <p>Coefficients</p> <table border="1"> <thead> <tr> <th>Name</th> <th>Value</th> <th>Name</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>Offset_S</td> <td>-891272</td> <td>Offset_T</td> <td>0</td> </tr> <tr> <td>Gain_S</td> <td>4616305</td> <td>Gain_T</td> <td>0</td> </tr> <tr> <td>TCG</td> <td>0</td> <td>SOT_T</td> <td>0</td> </tr> <tr> <td>TCO</td> <td>0</td> <td></td> <td></td> </tr> <tr> <td>SOT_TCO</td> <td>0</td> <td></td> <td></td> </tr> <tr> <td>SOT_TCG</td> <td>0</td> <td></td> <td></td> </tr> <tr> <td>SOT_S</td> <td>0</td> <td></td> <td></td> </tr> </tbody> </table>			S[%]	S[counts]	T[°C]	T[counts]	1	25	1659648	30	-1112064	2	75	5470528	30	-1110016	3					4					5					6					7					Name	Value	Name	Value	Offset_S	-891272	Offset_T	0	Gain_S	4616305	Gain_T	0	TCG	0	SOT_T	0	TCO	0			SOT_TCO	0			SOT_TCG	0			SOT_S	0			<p>Calibration Points</p> <p>2 Points: B(O+G)</p> <table border="1"> <thead> <tr> <th></th> <th>S[%]</th> <th>S[counts]</th> <th>T[°C]</th> <th>T[counts]</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>25</td> <td>227584</td> <td>30</td> <td>-1331200</td> </tr> <tr> <td>2</td> <td>75</td> <td>-2404352</td> <td>30</td> <td>-1337344</td> </tr> <tr> <td>3</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>4</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>5</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>6</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>7</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <p>Temperature Limits: Tmin[°C] <input type="text" value="-40"/> Tmax[°C] <input type="text" value="125"/></p> <p>Calculate Coefficients Write Coefficients to Memory</p> <p>Coefficients</p> <table border="1"> <thead> <tr> <th>Name</th> <th>Value</th> <th>Name</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>Offset_S</td> <td>272096</td> <td>Offset_T</td> <td>0</td> </tr> <tr> <td>Gain_S</td> <td>-6684123</td> <td>Gain_T</td> <td>0</td> </tr> <tr> <td>TCG</td> <td>0</td> <td>SOT_T</td> <td>0</td> </tr> <tr> <td>TCO</td> <td>0</td> <td></td> <td></td> </tr> <tr> <td>SOT_TCO</td> <td>0</td> <td></td> <td></td> </tr> <tr> <td>SOT_TCG</td> <td>0</td> <td></td> <td></td> </tr> <tr> <td>SOT_S</td> <td>0</td> <td></td> <td></td> </tr> </tbody> </table>			S[%]	S[counts]	T[°C]	T[counts]	1	25	227584	30	-1331200	2	75	-2404352	30	-1337344	3					4					5					6					7					Name	Value	Name	Value	Offset_S	272096	Offset_T	0	Gain_S	-6684123	Gain_T	0	TCG	0	SOT_T	0	TCO	0			SOT_TCO	0			SOT_TCG	0			SOT_S	0		
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### 5.3 Calibration Log

The calibration log is a csv-file that is generated by clicking the *Open Calibration Log* button. See Figure 7 as an example for the log summary.

Raw_Calib Applied DUT : [2, 12]										
#DUT	2									
ref_S[%]	raw_S[counts]	ref_T[degC]	raw_T[counts]							
25.0	1659648	30.0	-1112064							
75.0	5470528	30.0	-1110016							
Coefficient										
-891272	4616305	0	0	0	0	0	0	0	0	0
#DUT	12									
ref_S[%]	raw_S[counts]	ref_T[degC]	raw_T[counts]							
25.0	227584	30.0	-1331200							
75.0	-2404352	30.0	-1337344							
Coefficient										
272096	-6684123	0	0	0	0	0	0	0	0	0
NVM data										
#DUT	2									
43010	12	72	9220	11044	62933	38705	0	0	0	0
#DUT	12									
43282	48059	72	9220	14116	60392	33418	0	0	0	0

**Figure 7. Example of a Calibration Log**

Note: The calibration log provides the resulting coefficients after their calculation, but the values are not written into the memory. The NVM data in the log and the coefficients are only consistent after successfully writing the coefficients into the DUTs memory.



## Glossary

Term	Description
ACK	Acknowledge (interface's protocol indicator for successful data/command transfer)
CB	Communication Board
DUT	Device Under Test
EB	Evaluation Board
GUI	Graphical User Interface
HW	Hardware
IC	Integrated Circuit
ID	Identifier
K	Connector
LSB	Least Significant Bit
MC	Mass Calibration
MCB	Mass Calibration Board
MCS	Mass Calibration System
NVM	Nonvolatile Memory
OWI	One Wire Interface
PC	Personal Computer
SDA	Serial data for I2C communication interface
SCL	Clock for I2C communication interface
SSC	Sensor Signal Conditioner
SW	Software
USB	Universal Serial Bus
VDC	Volts Direct Current
VDD	Voltage Drain Drain

## Revision History

Rev.	Date	Description	
		Page	Summary
1.0	26.01.2021		Initial Release

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